

## 2-Dimension Channel Coding System

### BACKGROUND OF INVENTION

5 This invention is a coding technique on TV channel organization, specially on a 2-dimension coding order and system.

Nowadays the computer technology is able to integrate  
10 the contents from wireless broadcasting, cabled broadcasting, and web systems, and then output to TV as separate channels, as many channels as we want. The number of channels is technically unlimited and the TV users may be confused. This invention is designed  
15 to re-organize the traditional channel arrangement and enhance the convenience in channel selection by TV users.

### SUMMARY OF THE INVENTION.

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This invention re-organizes the access paths and sequence of various contents channels, and make it into a "2-dimension channel coding system" to facilitate the identification and selection on TV channels by TV  
25 users who usually operating remote controllers. The major purpose of this invention is to provide a technique-integrated system, the 2-dimension channel

coding system, to execute the re-organization of various channels in the 2-dimension order.

Another purpose of this invention is to provide the method to organize the access path and sequence to each  
5 channel in a 2-dimension order. In this system, TV channels are arranged in 2 hierarchies, the directory code channels in the first hierarchy and the folder code channels in the 2<sup>nd</sup> hierarchy, on which channels in the different hierarchies constitute their own  
10 dimensions against the traditional linear arrangement of TV channels numbered from channel 1 and up in only one dimension. The directory codes in the 1<sup>st</sup> hierarchy are of fixed number of digits denoting major channels, and the folder codes in the 2<sup>nd</sup> hierarchy are of  
15 non-fixed number of digits to denote the sub-channels within a directory code channels.

Other than the coding technique, the function modules of this invention consists of an input receiver, a micro-processor, a memory module, a LAN module, a tuner,  
20 and a VGA display module for TV. With the integration of coding technique and these function modules, this invention is able to take signals inputted from wireless broadcasting, cabled broadcasting, and web system, and then output to TV sets as separate channels. TV users  
25 are benefited from this invention in better identifying and selecting abilities over numerous TV channels.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is the modular diagram of this 2-dimension channel coding system;

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Fig. 2 is the structure of this 2-dimension channel coding system;

Fig. 3 is the data organization in the memory module.

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## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Fig. 1 is the modular diagram of this 2-dimension channel coding system, which consists of 6 function modules. Each of an electronic component readily available in the commercial market. They are:

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1. Input Receiver 11. A module to receive input from TV user. Usually, it can't take input directly from human users, and all inputs are sent from a remote controller 2 operated by the user. Since most of the TV remote controller 2 send out signals by IR (Infrared Rays) or RF (Radio Frequency), input receiver 11 is often an IR/RF transmitter. All inputs received by this module will be transmitted to micro-processor 12 for further processing.

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2. Micro-processor 12. A general purpose computer processor, like the central process unit made by Intel, AMD, Motorola or National Semiconductors, is sufficiently capable of being used here. In this system, micro-processor 12, based on the inputs received, runs the programs residing in the memory. The result will be the decision on selecting channels to be played.
3. Memory Module 13. General purpose memory chips of semiconductor for personal computers are used here, on which data and programs can be read, written, and stored. Memory communicates only with micro-processor, and its data organization shall be explained in detail.
4. LAN Module 14. It is a standard LAN chip or a LAN card used in personal computers for communicating with network or web system. Information received by LAN Module 14 will be transmitted to TV Display for output to TV.
5. Tuner 15. It is a standard tuner used in TV sets to select broadcasting channels and connected to cable terminal or antenna for input of signals. Signals received by tuner 15 is transmitted to TV Display for output to TV.

6. VGA Display Module for TV 16 (TV Display). This module is called "TV Display" for convenience. It takes input from LAN module 14 or tuner 15 and outputs to TV, with 3 output ports: audio, video, and super  
5 VHS. The traditional TV Display receives only input from TV tuner 15, which is the most common type used in TV sets. In this system, the output of LAN module 14 is also connected to TV Display which utilizes the technique of personal computer that outputs the  
10 LAN signals to a monitor. This TV Display could be a traditional one combined with a computer display module or a VGA module, or, the better way, made into an ASIC (Applied Special Integrated Circuits) to reduce its physical size.

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All the function modules listed above can be implemented physically in a box, a card, or an ASIC (Applied Special Integrated Circuits) depending on the manufacturing technology used.

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Fig. 2 is the structure of this 2-dimension channel coding system, showing access paths and sequence among channels.

25 This system organizes TV channel codes into 2 hierarchies, the directory codes of the 1<sup>st</sup> hierarchy, and the folder codes of the 2<sup>nd</sup> hierarchy:

Directory Code

Folder Code

XXX

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YYY.....

Directory code: composed of 3 digits, i.e., 000, 001, 002, 003 up to 999.

- 5 Folder code: composed of arbitrarily assigned digits, i.e., 0, 01, 333 or 8888.

This coding system allocates total 1,000 TV channels in the 1<sup>st</sup> hierarchy, each designated by its directory  
10 code. When the TV is playing a directory code channel, the channel designated by other directory code, no matter being from TV stations, RF broadcasting or websites, can be selected and viewed, that is, accessed, by:

- 15 1. Using the "Channel Up" and "Channel Down" functions.  
2. Directly enter the directory code.

If there are channels designated by the folder codes within a directory code channel, a specific area in  
20 the TV or monitor screen will display these folder codes for selection by audience. This specific display area is usually called a "window", though not necessarily in the shape of a window, because it contains contents different from its background - the  
25 screen. Folder code channels can be selected by means of:

1. "Up", "Down", "Right", and "Left" function followed

by "Enter" function, when a folder code window is shown on the screen.

2. When the TV is playing a folder code channel, directly entering the folder code under the same  
5 directory code.

When in a folder code channel, it can be switched to other folder code channels under the same directory code. It may not be switched directly to channels  
10 designated by other directory codes, or to folder code channels under other directory codes. In a folder code channel, it has to be switched back to its directory code channel and then a selection on other directory code channels can be made.

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This system can be implemented on existing broadcasting system, web system and TV sets without changing any current industry structure. It also retains the habitual practice by TV users on switching  
20 TV channels.

The most common interface for TV users today, and also in foreseeable future, is the remote controller that used to operate TV set. In order to keep users' habitual  
25 practice on selecting TV channels, remote controller is used as the input interface in this implementation.

Not all the functions on the remote controller relate to the selection of channels. For example, volume control keys has nothing to do with channel selecting. The functions of the channel related inputs from remote  
5 controller are:

1. "Power". To turn on or turn off the system. At the time the system is just turned on, it shows the channel played, no matter being directory code  
10 channel or folder code channel, while it was turned off last time.

2. "Channel Up" and "Channel Down". To select the directory code channels by sequentially moving to  
15 the next or previous one to the currently played channel. They don't work on the channels of folder codes. If "Channel Up" and "Channel Down" are inputted when a folder code channel is played, there will be no change to the channel currently played and a sound  
20 or a beep signaling error is emitted to TV user's attention.

3. "Display". This function key is dedicated to show the folder code window under current directory code  
25 channel. This window lasts on screen for n sounds (n is arbitrarily set by system builder) and will disappear automatically.



4. "aaa..." (digits). A series of digits representing the code of a channel demanded by user, being either directory code or folder code.

When a directory code channel is played and there is no folder code window shown on screen, this input will be taken as the directory code and channel of that directory code will be selected.

When a directory code channel is played with its folder code window shown, this input is taken as the folder code under this directory code and this folder code channel will be selected. If it is not a valid folder code (that is, no folder code channel of the inputted "code" exists under current directory code), there will be no change to the channel currently played and a sound or a beep of error message is emitted to TV user's attention.

When a folder code channel is played, this input is taken as the folder code under the same directory code and this folder code channel will be selected. Again, if it is not a valid folder code, there will be no change to the channel currently played and an error message is sent.

5. "Back". To returned to the current directory code channel from its folder code channel.

6. "Left", "Right", "Up", "Down". They are usually keys

in triangle around the "Enter" key in the remote controller, used to move the cursor positioned on a folder code channel shown on the window. These four keys are only able to move the cursor while a window showing up; not able to switch to the folder code channel positioned without being followed by an "Enter" key.

7. "Enter". This function key is used to confirm the selection on a folder code channel with a cursor positioned on when a folder code window is shown.

Fig. 3 is the data organization in the memory module. The programs and data needed to operate this system are stored in the memory. They are:

1. Operating system and execution programs. Operating system can be any commercial system like WinCE or Linux, or can be proprietary operating system specially developed. It offers a platform for user's program to be executed. The execution programs are working procedures written and coded on the platform of operating system, and they process inputs with reference to the data in the memory to make decision on the action of this system.

2. Directory code and folder code table. This table is

a database containing all information about the valid channels. They are of three parts:

- a. All directory code channels and their frequencies at tuner or web address accessible through LAN module.
- b. All the folder code channels under every directory code channels.
- c. The frequency or web address of each folder code channel under a directory code.

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3. Current Directory Code Channel XXX and Current Folder Code Channel YYY. We will call them Current Channel XXX and Current Channel YYY for convenience. XXX and YYY are parameters containing the code, always in digits, of currently played directory code channel and folder code channel respectively.

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4. Cursor Position C. it is a parameter containing the folder code on which a cursor is placed when a folder code window is shown.

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5. Directory/Folder Mode Flag DE. It is a parameter with its contents to be either "D" or "F". "D" means that the channel now being played is a directory code channel, and "F" a folder code channel. When the Mode Flag DE is "D", the selection on other directory code channel or the folder code channels under Current

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Channel XXX is possible. When the Mode Flag DE is  
"F", only selection on other folder code channels  
under the same Current Channel XXX is possible, and  
any selection on other directory code channel can  
5 only be done after returning to its directory code  
channel by entering "Back" key.

6. Window Show Up Flag W. It is a parameter with its  
contents to be either "Yes" or "No". W is set to "Yes"  
10 when a folder code window is shown on the screen of  
a TV or monitor, and set to "No" when a window is  
erased after its duration.

To accomplish the operation of this system, micro-  
15 processor will perform different procedures according  
to the input, and these procedures are written and  
coded on the platform of the operating system. Each  
procedure can be further breakdowned into basic  
actions to be executed by micro-processor, and many  
20 of these basic actions in different procedures are in  
common. Therefore, we can abstract these basic actions,  
calling them executions, and use them to construct  
procedures. Both the executions and procedures are  
general logic that can implemented on different  
25 platforms, that is, they are independent of platforms.

There are 17 executions needed to carry out the

operation of procedures:

- ①Read the Directory/Folder Mode Flag DF.
- 5   ②Read the frequency or web address of Current Channel XXX from memory as the channel to be played.
- ③Read Current Channel XXX, read the first folder code under XXX, write this folder code to Current Channel
- 10   YYY and Cursor Position C.
- ④Select the frequency or web address from tuner or LAN module and pass the contents received to TV Display.
- 15   ⑤Read the frequency or web address of Current Channel YYY under Current Channel XXX as the channel to be played. Write YYY to Cursor Position C.
- ⑥Increment Current Channel XXX by 1.
- 20   ⑦Decrement Current Channel XXX by 1.
- ⑧If input is a single digit a, write 00a to XXX.  
If input is a 2-digit aa, write 0aa to XXX.
- 25   If input is a 3-digit aaa, write aaa to XXX.  
If input is of 4 or more digits aaaa..., write the first 3 digits aaa to XXX.

- ⑨ Display folder code window of Current Channel XXX.
- ⑩ Write input aaa... to Current Channel YYY and Cursor  
5 Position C.
- ⑪ Emit an error message by a sound or beep.
- ⑫ Match input aaa... with the folder codes under Current  
10 Channel XXX.
- ⑬ Write "F" to Directory/Folder Mode Flag DE.
- ⑭ Write "D" to Directory/Folder Mode Flag DE.  
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- ⑮ Read the folder code next to the Current Channel YYY  
under Current Channel XXX, write it to Cursor  
Position C.
- ⑯ Read the folder code previous to the Current Channel  
20 YYY under Current Channel XXX, write it to Cursor  
Position C.
- ⑰ Write Cursor Position C to Current Channel YYY.  
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About the execution ⑨ "Display folder code window of  
Current Channel XXX", further explanation and

breakdown are needed. It is a series of executions by micro-processor to paste a window over the TV screen, showing the list of all folder code channels under current directory code with a cursor positioned on a  
5 selected folder code.

The details of this execution are:

1. Read Current Channel XXX.
2. Read all folder codes under Current Channel XXX.
- 10 3. Read Cursor Position C.
4. Execute graphic processing to make window image.
5. Output the window image to TV Display.
6. Start to count n seconds (n seconds is the duration time of this window on screen).
- 15 7. Write "Yes" to Window Show Up Flag W.
8. Stop output of window image to TV Display after n seconds counted.
9. Write "No" to Windows Show Up Flag W.
10. Write Current Channel YYY to Cursor Position C.

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For each input, a procedure composed of executions is dedicated to processing it. There are 9 procedures needed to fulfill the operation of this system. In the following procedures, the circled numbers are the  
25 executions listed above and to be executed in the course of their text order. An end in parenthesis denotes the end of processing on this input.

1. When input is "Power"

    If the power is on, then turn off the power (end).

    If the power is off, then turn on the power, ①,

        If DE = D, then ②, ③, ④, ⑨ (end)

5      If DE = F, then ⑤, ④, ⑨ (end)

2. When input is "Channel Up"

    ①, if DE = D, then ⑥, ③, ②, ④, ⑨ (end)

        if DE = F, then ⑪ (end)

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3. When input is "Channel Down"

    ①, if DE = D, then ⑦, ③, ②, ④, ⑨ (end)

        if DE = F, then ⑪ (end)

15 4. When input is "Display"

    ⑨ (end)

5. When input is "aaa..." (digits)

    ②, if DE = D and W = No, then ⑧, ③, ②, ④, ⑨ (end)

20      if DE = D and W = Yes, then ⑫,

        if found, then ⑬, ⑩, ⑤, ④, ⑨ (end)

        if not found, then ⑪, ⑨ (end)

        if DE = F, then ⑫,

            if found, then ⑩, ⑤, ④, ⑨ (end)

25      if not found, then ⑪, ⑨ (end)

6. When input is "Back"



⑭, ②, ③, ④ (end)

7. When input is "Right" or "Up"

If (W = No and DE = F) or W = Yes, then ⑮, ⑨ (end)

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8. When input is "Left" or "Down"

If (W = No and DE = F) or W = Yes, then ⑯, ⑨ (end)

9. When input is "Enter"

10 If DE = D and W = Yes, then ⑬, ⑰, ⑤, ④, ⑨ (end)

If DE = F and W = Yes, then ⑰, ⑤, ④, ⑨ (end)

By the method described above, a 2-dimension channel coding system is able to take various channel sources,  
15 including wireless broadcasting, cabled broadcasting, and web system, and re-organize them by the 2-dimension access paths and sequence. It enhances TV user's convenience in channel identification and selection with existing TV control instruments. Therefore, this  
20 invention is innovative and of practical value, which meets the requirements and essence of a patent.

The implementation of this invention described above is not the only form possible. There may be  
25 modifications and deviations from this original one, though based on the same idea, design modules, method or applications described in this invention. All this

modifications and organization applied in TV channel structure are within the scope claimed by this invention.